

# Conference Report

## BNS Symposium

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Recently, food classification and coding systems based on the degree of processing have been introduced to redefine food-based dietary guidelines hereby taking into account the potential role of processed foods on human health. Ultra-processed foods have received special attention in view of the higher levels of salt, added sugar, fat and additives to influence the palatability of products in this food category.

In this edition of the BNS annual congress, a balanced view was brought on the role of (ultra)processed foods in human nutrition and health. Attention was paid to the classification of foods based on degree of processing, and an overall state of the art regarding the impact of processed foods on human nutrition and health was given. Next, the role of processing in food science and nutrition was highlighted, and the contribution of nutrient intake from processed foods was discussed, in relation to their potential role towards human health. There is also a more global view of food processing, taking into account the international trade and globalization of food and dietary patterns in both developed and developing countries.

### SESSION 1

Keynote 1: Prof. M. Gibney - Ultra-processed foods in human health: a critical appraisal

In his talk, Prof. Gibney elaborated on how nutritional information regarding processed foods should be formulated.

#### INTRO

- In the near future, the whole food chain will have to be reinvented, in order to curb the impacts our current food system has on our health.
- Prof Gibney himself is currently working with some global food giants on a reinvention product.

#### DEFINITION OF PROCESSED FOOD

- A current definition mentions the addition of additives for two purposes: the imitation of natural food products & the disguise of unwanted characteristics. Prof Gibney stressed that this definition was neither comprehensive, clear or workable. What are “undesirable properties?”
- On the NOVA-classification system, he gave the critique that it is unclear what is meant by ‘mass produced’ and what this has to do with any impact on health.
- In terms of communication to the public, the question was raised as to how nutritional content (f.i. sugar content, fiber – or fat content) should be communicated: per kcal? Per 100g? or per portion?
- He also mentioned that in order to measure the population impact of a certain food product, one should take account of the amount of people consuming it!

#### LINK OF PROCESSED FOOD CONSUMPTION WITH OBESITY

- In this section Prof. Gibney mentioned that some articles DO find a link between processed food consumption and obesity (measured by BMI) while some DON'T. He asks the question what lies behind this discrepancy: who's doing it wrong?
- He tackles some possible hiats in the studies: 1) purchases at the supermarket do not tell you who ate the food. 2) on self- reported obesity he mentioned that people in general always overestimate their length and underestimate their weight.
- Conclusion here is that a clear definition of processed foods is required to find clear links between food processing and obesity.

#### PUBLIC NUTRITION INITIATIVES

- How can we change people's eating behaviour? => tackle 2 aspects: 1) change consumption pattern. F.i. persuade people to eat breakfast or to eat less meat or less ready meals. 2) Change the composition of food products, f.i. lowered fat products etc.
- He goes back to the NOVA-classification system saying it might not be clear enough to be used as a public information tool. F.i. it mentions that 'ultra-processed foods are nutritionally unbalanced' but give the critique that carrots are too, in that no one could live on carrots alone!
- On to some initiative that are already underway: in Ireland, a project has been implemented to reduce the consumption if UPF by 20%
- In an attempt to defend processed foods, he also mentioned a study that showed that the biggest cause of obesity is portion control, even over food composition. He didn't seem to realize that food composition and portion control might be linked.
- He also mentioned some older public health initiatives which have been implemented to reduce levels of salt, saturated fat, trans fat, sugar... in food products currently on the market.
- As a more favourable and possibly more effective option to alter people's consumption behaviour Prof. Gibney mentioned 'nudging' as a way in which people might be led to the right choices, so they don't have to look for them themselves anymore. He gave the example of putting cookies on higher shelves in a rack with snacks, and fruit on the racks at eyesight, which apparently made children go for the fruit X% more of the time.

#### Oral presentation: Lise Deroover - Wheat bran with reduced particle size does not affect gut health and systemic health in normal weight and obese subjects

This girl works on the **Branding project** and presented her work on an intervention study with wheat bran as a prebiotic.

Consumption of prebiotics, and wheat bran in particular, has been linked with health effects (weight maintenance, CVD,...). In her **intervention study**, 20 individuals – obese or normal BMI - did or did not (control) receive wheat bran particles. Goal was to study the effect of wheat bran in vivo on the fermentation capacity of the gut microbiota. Fecal samples as well as blood samples were taken.

Overall the results of this trial showed quite weak effects of the wheat bran. It was oppered later that this might have been because of an **inclusion of 10g** of inulin in the treatment, which may already have had a fiber effect. Results on SCFA-extraction from the faeces indicated that WB consumption lowered propionate levels in obese individuals. Also butyrate levels increased after wheat bran consumption. On the other hand, no difference was detected in total SCFA-levels between the treatment and the placebo. Faecal output was no different either, but WB did seem to reduce the fat content in the faeces. And in this trial, no effect was found on gut permeability or lipid metabolism, while obese individuals did show higher levels of blood cholesterol and CRP, an inflammatory marker)

In conclusion, only **limited effects of WB-supplementation** could be found during this experiment. **Confounding factor** was also the different **background fiber consumption** of the different individuals, coming from their normal diet. Another conclusion Lise made was that her obese individuals might not have been 'obese enough' to see the benefits of the WB supplementation.

Oral presentation: Moyersoen Isabelle - Do current fortification and supplementation programs assure adequate intake of fat soluble vitamins in Belgium?

This woman explained some results from the **Vitadek project**. The aim of this study was to study the **intake of fat soluble vitamins – vit A, D, E and K** – in different groups at risk of inadequate intakes. These groups comprised **infants, children and pregnant and lactating women**. The reason for studying these vitamins specifically was because, next to inadequate intake levels, also overconsumption is reported to cause health risks. They are also crucial in growth and development, hence the choice of social groups.

In total **2300 individuals** were followed up. Dietary intakes were assessed by filling out Food frequency questionnaires and doing 24h and 48h recalls. To determine inadequate intake levels, the EAR-cutoff method was used when applicable, which is based on data for minimal requirement. For vitamin D, E and K, such information was too limited so here the AI (adequate intake levels) were applied. Excessive intakes were determined by comparing with Upper intake levels.

Results indicated that in each population group, **inadequate intakes of vit A were detected**, while practically no overconsumption was detected, even in individuals taking supplements. For vit D the intake levels were compared to the AI-levels and the P50 of the data were only at approx. 25% of the AI-levels in most social groups. This could indicate a possible risk for underconsumption in all these sensitive categories of people.

## **SESSION 2**

Keynote 2: Prof. Frank Devlieghere - Role of food processing in food science and nutrition

Just like prof Gibney earlier, Prof Devlieghere elaborated on the definition of food processing and the NOVA-classification system in terms of how useful they are with respect to communication to the public.

He started by uttering a note of **critique** to most recent Flemish food pyramid. In this latest version, the advice is included to limit the consumption of uprocessed products as much as possible. Prof. Devlieghere states that this formulation is too unclear. Also in the NOVA-classification system, he discovered some details he stated could raise doubt: why is pasta in the unprocessed or minimally processed food group f.i. while in his opinion pasta is quite a processed product? In the same way, why is 'refining' not classified higher than the second processing group? And why are unpackaged breads in group 3; what does 'unpackaged' even mean? Or why are burgers in the last category, while meat burgers from a butcher are mainly pure meat?

In Prof Devlieghere's opinion, processing depends more on 1) the number of ingredients a food product contains, 2) the complexity of the product and 3) the packaging method. He mentions the danger of advising people to eat as unprocessed as possible, because certain commodities NEED processing to be SAFE for consumption.

**In favor of food processing** Prof. Devlieghere raised the question of what the difference is between processing on an industrial scale versus cooking in the kitchen. Aren't mostly the same processed used? The only difference he mentioned is that in the kitchen, the food is not meant to be stored for very long. It's meant to be eaten immediately. In favor of food additives, he mentioned that these can also be useful and vital to the increased shelf lives of products. Without these long shelf lives, lots of food

might actually be lost, increasing the already vast amounts of **food waste** in this world. Other things he mentioned are the convenience factor of processed food, which allows humans to spend time in other ways than to look for an prepare food. He stated that **food fortification** can be very useful to ensure adequate micronutrient intakes.

On the **nutritional value** of processed foods, Prof Devlieghere mentioned that, indeed, refining grains causes a great loss of nutrients. On the other hand, removing the outer layers of a grain kernel also reduces the load of mycotoxins! Another example where processing might be advantageous is the concentration of lycopene in tomato paste, the increased availability of Beta-carotene in cooked carrots and the prolonged preservation of nutrients in frozen spinach. Conclusion is that **not all processing is inherently bad** and that this must be communicated to the public as well.

So is focussing on food processing the way to go to solve current global health issues? Prof Devlieghere claims not. He recognises that there are certain problems related to processing, yet nuances need to be communicated as well. He claims focus should be placed more on nutrient contents of food products, when communicating to the public, because focussing on processing alone may be inappropriate, risky and dangerous.

#### Oral presentation: Wim Geeraerts - Bacterial species diversity on vegetarian, vegan, and insect alternatives for meat in the Belgian retail

Mr. Geeraerts presented some work he did on the **bacterial load of vegetarian and vegan food products** on the Belgian Market.

His results showed that the **bacterial load** of most products was **extremely low**, which indicates that they comply with regulations easily. Bacterial flora were also highly dependent on the precise composition of the products. *Lactobacilli* were species that seemed to occur the most, although the actual species were usually different from those encountered on meat products. *E. faecium* was also found on some products, a species rarely found on meat products.

Overall, health risks concerning bacteria on vegetarian and vegan food products are negligible due to low loads.

#### Oral presentation: Henry Ambayo - Development of an ontology for standardizing nutritional epidemiological study metadata and improving interoperability

Henri Ambayo talked about an **ontology based search system** he is developing for improved development of nutrition policy. This new model of a search engine is meant to provide a more comprehensive search for scientific articles and data.

Why base on ontology? => Mr. Ambayo stated that his search engine will allow to integrate datasets and to do pooled analyses more easily. This should serve advances in nutrition analysis.

Henri Ambayo stated that keyword based systems often carry the disadvantage that relevant articles may be missed, just when using the wrong keywords. He also mentioned that data from scientific research is not always stored in a proper way, which causes lots of data to become unobtainable.

In Mr Ambayo's search engine is (**DISCOVER**) , when searching for a topic, **related concepts and links to databases will directly be given**. It will also display several menu's showing several categories of related topics, on which a search field can be further specified.

### **SESSION 3**

#### Keynote 3: Prof. Jean-Claude Moubarac-Ultra-processed foods, diet quality and health: summary of the evidence

Prof. Moubarac leads the research group where the NOVA-classification system stems from. In his talk Prof. Moubarac explained **his view on the current global food system** and elaborated how the NOVA-classification system could be a useful tool in developing strategies to improve it.

He started his talk stating that there are 3 current attention points surrounding nutrition: their impact on host (human) health, their environmental impact and their impact on the microbiota. He stressed that a healthy food pattern goes beyond nutritional aspect, but should also take account of how food is acquired, cooked, then combined and eaten, and further disposed of.

Prof. Moubarac recognises that food processing is indispensable to the current human society, but he stresses that the levels of food processing we are now capable of have altered our food systems and products in such a thorough way it will require us to revise certain products and processes.

In defence of his **NOVA system**, he mentioned that it is important to notice that the classification system was made based on **3 criteria**: not only the extent, but also the nature and purpose of food processing. He also stressed that the NOVA system IS being adapted when new scientific findings come across.

In terms of **ultra-processed food** products, Prof. Moubarac mentioned 3 criteria that distinguish them for the other 3 NOVA-groups: 1) they are usually heavily **marketed**, 2) they are usually **ready to consume** and 3) they mostly contain **additives**. Other aspects linked to these products are high palatability, quasi-addictive properties and supersize servings. Moubarac said that people have a different relationship with these food products than with other classes of food. Nutritional aspects that have been linked with consumption of ultra-processed foods are increased intakes of sugar, saturated fats and sodium and decreased intake levels of protein, fiber, magnesium and vitamin A. These relationships were obtained by using the NOVA-system as a food pattern analysis tool.

Other points in favor of a diet containing less processed foods were that cooking has been positively related to mental health, that certain additives have been related to altered gut microbiota and that a healthy food culture might also involve eating at a table, in a social setting, engaging in conversation, etc.

Oral presentation: Lisa Miclotte - Dietary Emulsifiers and the microbial gut community: Effects on SCFA-production and community structure

My own presentation.

I presented the results of the **batch experiments** that I have been performing over the last few months. I introduced by mentioning the occurrence of food additives and thus emulsifiers in certain food products. I explained the background research that B. Chassaing has been doing at Georgia State university, where he used carboxymethylcellulose and Tween 80 in mouse trials to investigate their effects on the human derived intestinal flora. His research group was able to show significant triggering of intestinal inflammation with alteration of the microbial flora and with implications in terms of weight gain and NCD.

In my batch experiments, I have combined **5 emulsifiers** – carboxymethylcellulose, tween80, soy lecithin, sophorolipids, rhamnolipids - in 3 concentrations (+ control of 0%) with human derived fecal bacteria. Endpoints I measured on 3 timepoints were **SCFA, Live- dead cellcounts and microbial composition**.

I was able to show that each of my **5 emulsifiers had a different and specific impact** on the bacterial gut flora of the donors. Soy lecithin, sophorolipids and rhamnolipids showed the most visible effects. Donor differences were also detected. Lastly, phenoflow analysis of the live-dead cellcount density

plots suggested that the microbial flora must be altered by administration of the emulsifiers. Illumina samples will be sent to elaborate which shift the emulsifiers trigger.

#### Oral presentation: Vandenbroele Jolien - Curbing portion size effects of processed foods at the point of purchase

This girl talked about the problem of increased **portion sizes**. She started by stating that if you double your portion size, it has been observed you'll eat 35% more.

Jolien has recently performed a **field experiment** in which she managed portion sizes of meat sausages in a supermarket and registered the sales of the different portions. On top of the existing option, she **added 2 smaller sizes**, the smallest one containing the daily recommended amount of 100g of meat. Her data showed that the smaller portions that were introduced, **WERE sold**. She also checked if people were not just buying more small sausages, instead of one big one, and concluded this was not the case. Decreasing portion sizes in shops might thus be a successful strategy to manage the weight of the population and moreover, to limit food waste.

Obviously, since the price of the meat sausages was weight-based, reducing the portions inevitably leads to smaller profit for the shop. Jolien stated however that this should be curbed by promoting consumption of other – healthier – products. She also noted that the cheaper price of the smaller portions might have actually been the nudge that convinced people to buy them.

#### **SESSION 4**

#### Keynote 4: Dr. S. Vandevijvere - Ultra-processed foods and the transformation of food systems: A global policy perspective

This woman is a collaborator of the **INFORMAS** network, which is an organisation with 22 member countries spread over the world and aiming at monitoring food systems, f.i. by use of questionnaires, in order to develop more efficient tools to create a more health-promoting food environment.

In her talk, Dr Vandevijvere focussed mainly on the liquid ultra-processed foods and talked about several initiatives when are in place or are being considered to alter the current food system. She, like the previous keynote speakers, also mentioned the communications of several organisations to limit the consumption ultra-processed foods. She also mentioned that the largest increase in processed food sales are currently happening in low- and middle-income countries.

Then she elaborated on some options and strategies that might alter consumer food choices. A main was the prohibition to advertise certain ultra-processed food products to children (alias children tv channels). These prohibitions would be based on **nutrient profiling systems**, like the PAHO-system, which focusses on sugar, total fat, saturated fat, trans fat or salt contents. A note she also made was that different food profiling systems might classify the same products differently, advisable or not advisable for consumption. Other measures coupled to these nutrient profiling systems are f.i. front of package labelling systems like traffic light coding and warning labels.

Another measure she mentioned, and which does seem to have an effect on sales, is **taxation**, f.i. of sugary drinks.

Dr Vandevijvere stated, however, that current policies and actual changes are too slow and that it is a focus point of the INFORMAS network to speed up this process.

Oral presentation: Marta Olivares: Arabinoxylan-oligosaccharides prevent obesity induced in mice by the addition of gluten in the Western diet

Ms. Olivares talked about the problem of the fraction of **gluten** in our diet and the link this has with the obesity problem.

She started by mentioning that the current **Western diet** usually contains **5 – 20 g of gluten per day**. Gluten make up 80 – 85% of the protein fraction in grains like wheat, barley and oats. To people who are sensitive to them, gluten may cause problems like coeliac disease or gluten sensitivity. With respect to obesity, Mrs. Olivares mentioned that gluten give off **immunogenic peptides** in the gut, which are able to cause inflammation and are able to cross the gut barrier as well (they were detected in urine, blood and breast milk). The other aspect of Ms. Olivares' research are **prebiotics**, which are a gut improvement strategy. She presented a **mouse experiment** she has done in which the influence of two prebiotics, arabinoxylans (**AXOS**) and fructo-oligosaccharides (**FOS**), are tested when gluten was added to the diet. 45 mice were divided into 5 groups: one control group, one receiving a diet formulated according to a Western diet profile (WD), a group with a WD + 5% gluten and 2 groups receiving one of the prebiotics on top of the WD and the gluten.

Her results showed that the WD-formulation made the mice gain weight and that AXOS could limit this weight gain a little, however FOS did not. AXOS also reduced adipocyte size, which were increased by the WD and the WD + the gluten. AXOS also improved the inflammatory markers in the guts of the mice, which were elevated when gluten was added. These compounds also increased the prevalence of Bifidobacteria.

The main conclusion was thus that **AXOS are compounds that are able to curb the weight gain and health influences caused by addition of gluten to the diet.**